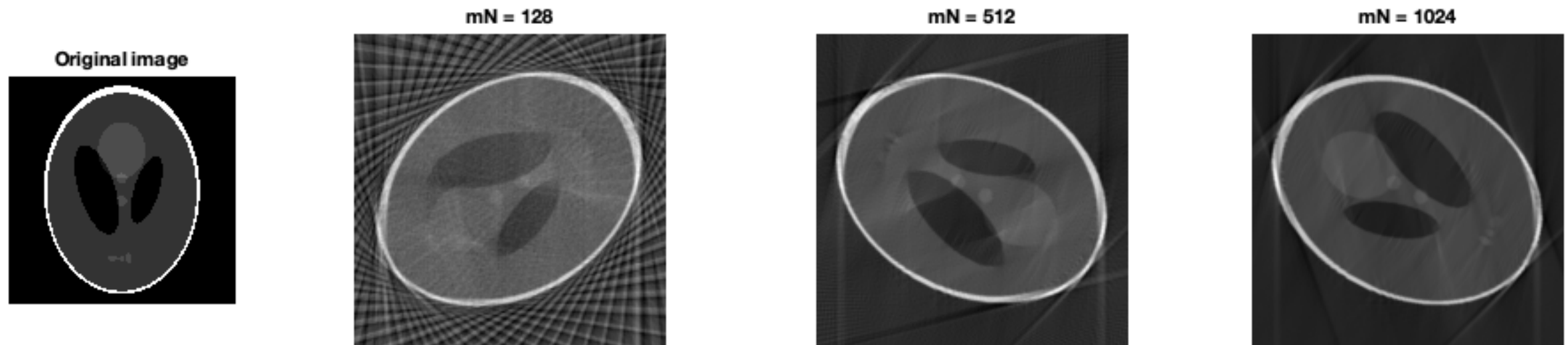


Tomography under unknown angles

Shreyas Pimpalgaonkar
160050024

- Graph Laplacians
- SLLE - different weight measurements
- Nearest Neighbour - without dimensionality reduction
- Unknown Shifts - with/without noise

Variation with number of angles

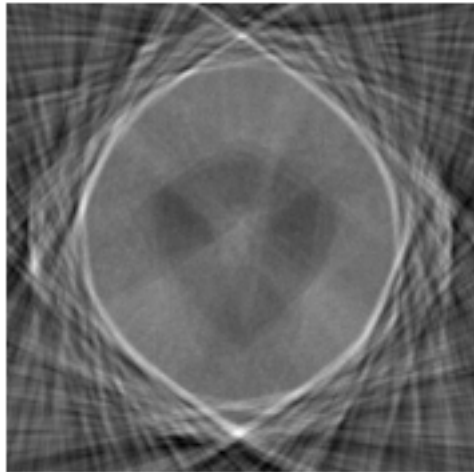


mN = projection angles, N = reconstruction angles, m = redundancy factor

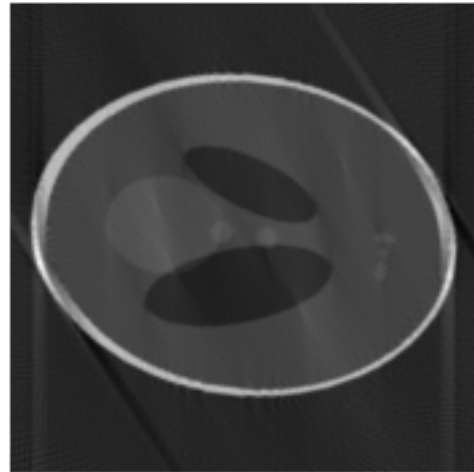
Better reconstruction with more angles

Variation with epsilon

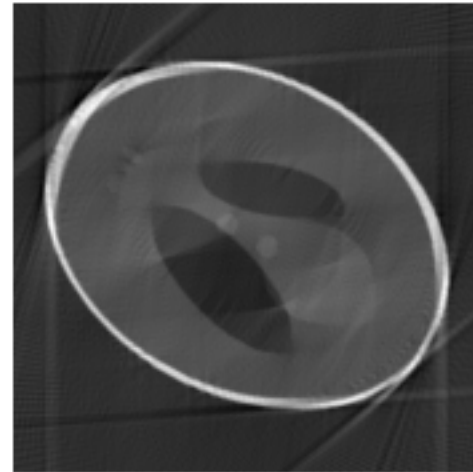
epsilon = 1



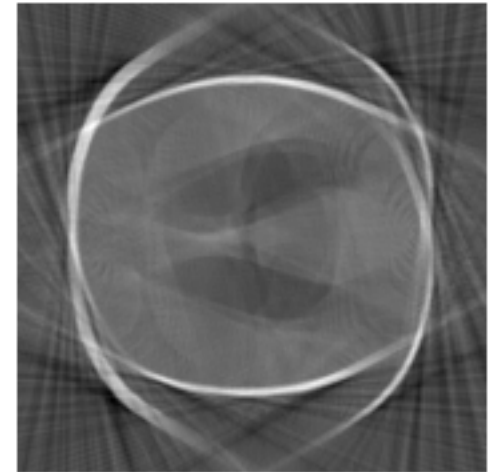
epsilon = 50



epsilon = 150

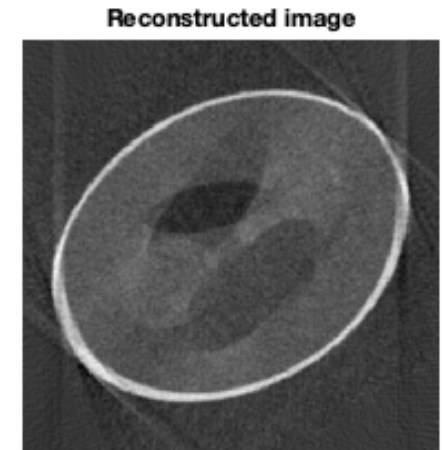
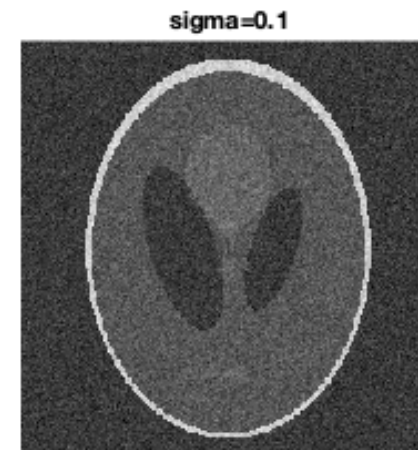
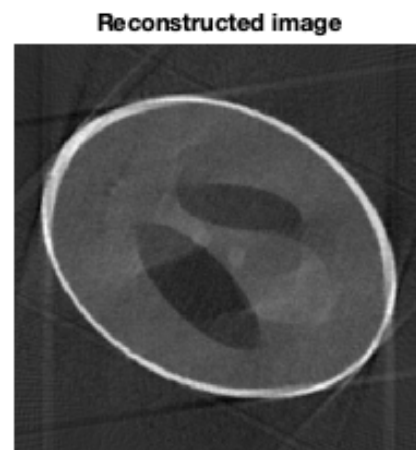
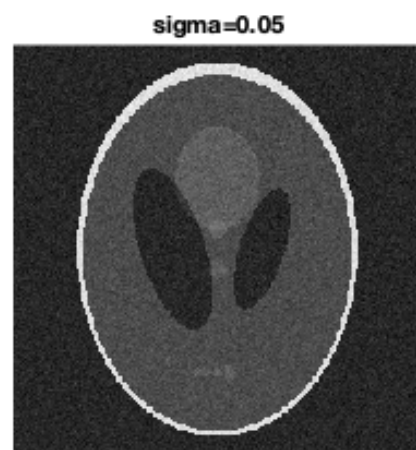


epsilon = 200

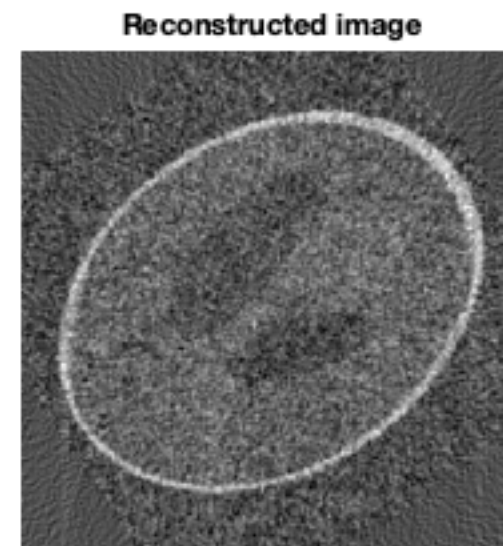
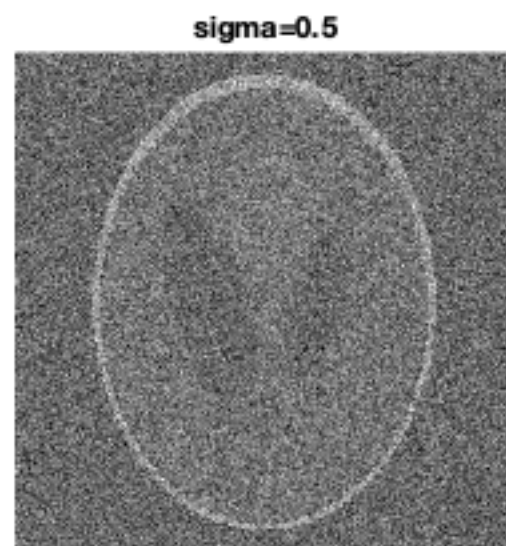


$$W_{ij} = k \left(\frac{\|\mathbf{x}_i - \mathbf{x}_j\|^2}{2\varepsilon} \right), \quad i, j = 1, \dots, N$$

Variation with noise level

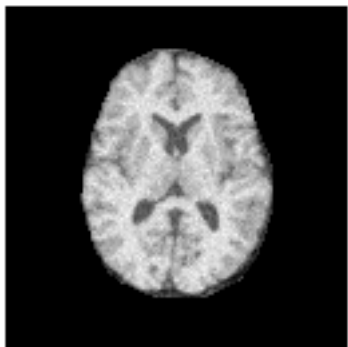


Able to reconstruct with large noise

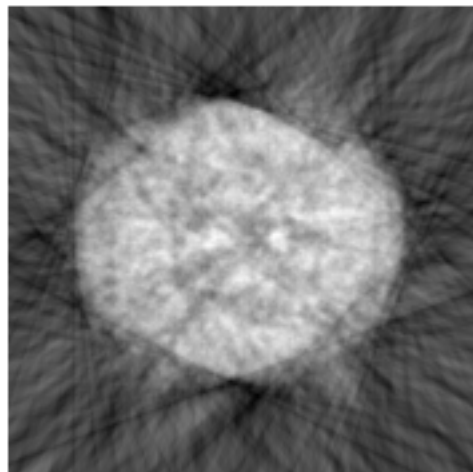


Testing on Brain image

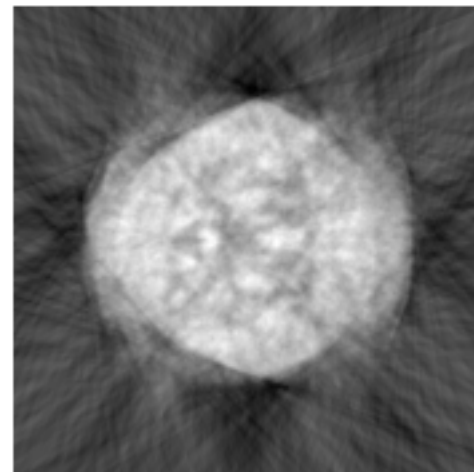
Original image



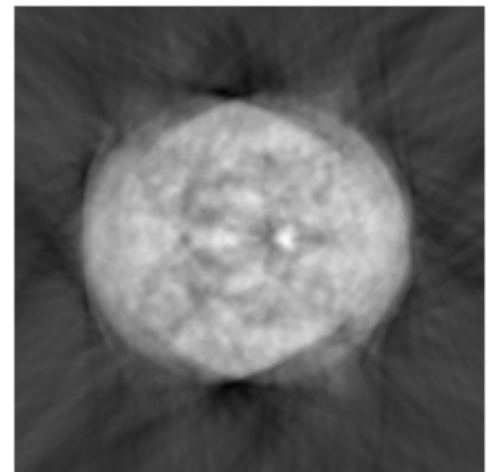
mN = 128



mN = 256

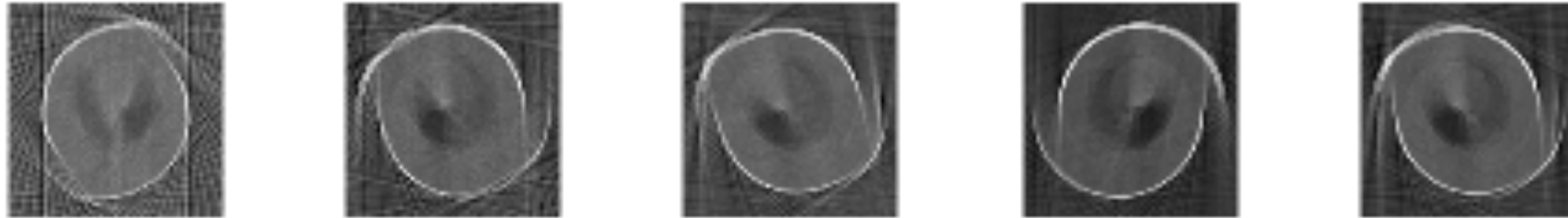


mN = 1024

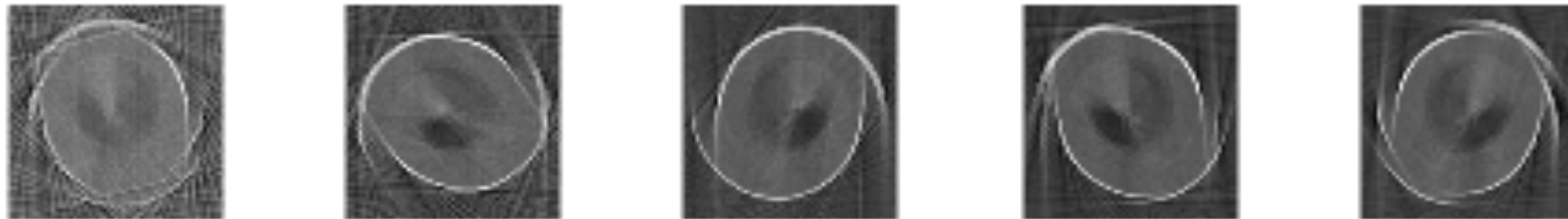


Variation with K and Angles

angles=32 K=1 angles=64 K=1 angles=128 K=1 angles=256 K=1 angles=512 K=1



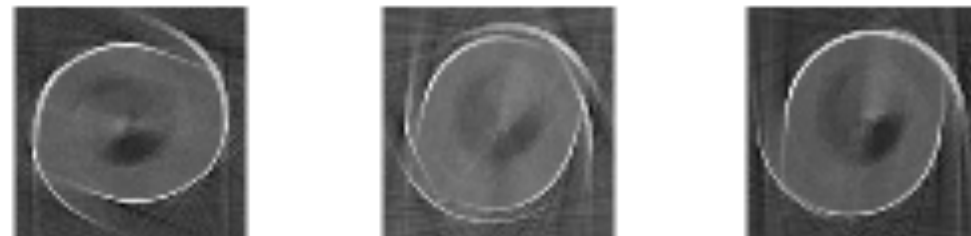
angles=32 K=10 angles=64 K=10 angles=128 K=10 angles=256 K=10 angles=512 K=10



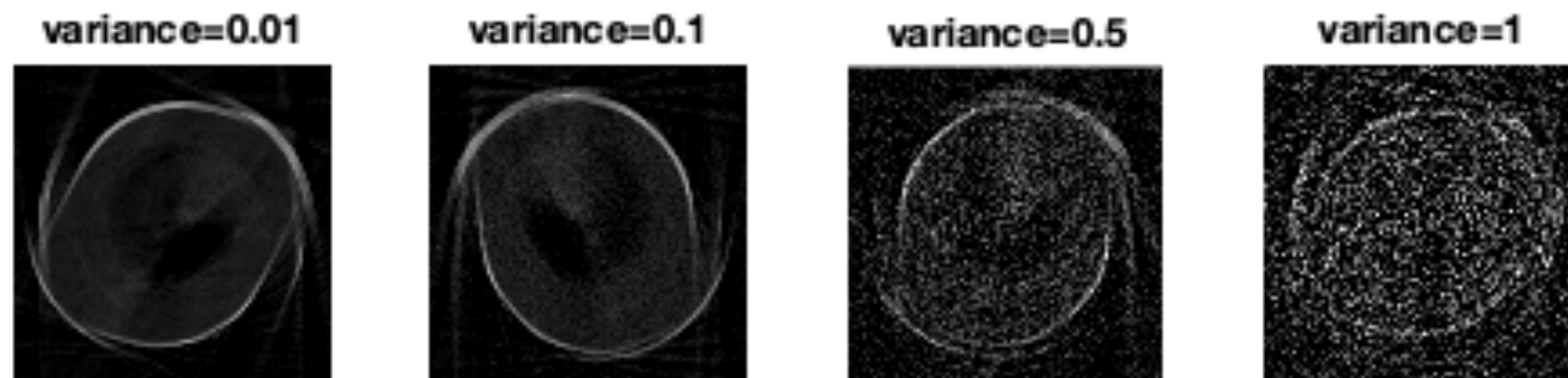
angles=64 K=50 angles=128 K=50 angles=256 K=50 angles=512 K=50



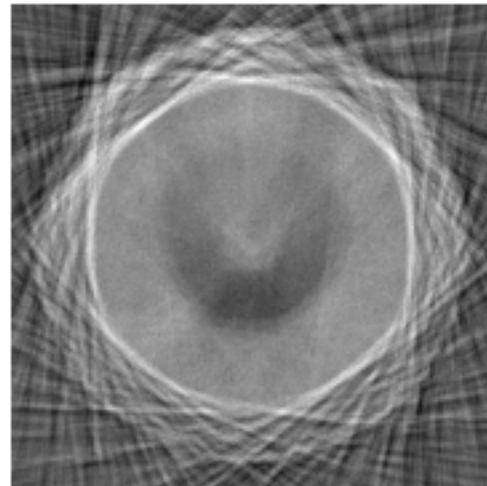
angles=128 K=100 angles=256 K=100 angles=512 K=100



Variation with noise



Ordering based approach



Unknown shifts

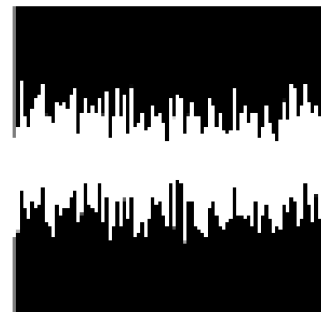
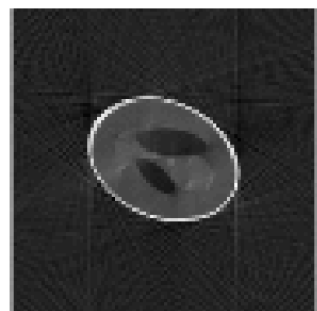
Sinogram with random shifts per angle for some range



Normalised sinogram



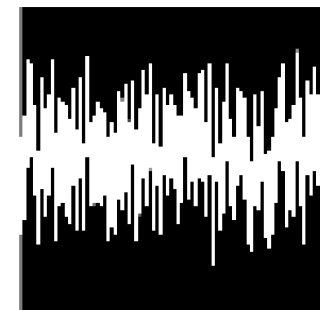
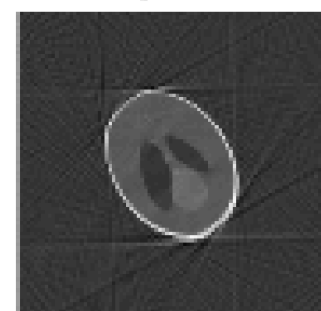
range = 10



Normalised sinogram



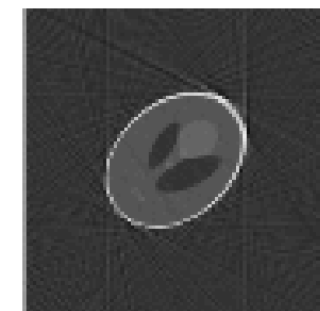
range = 50



Normalised sinogram

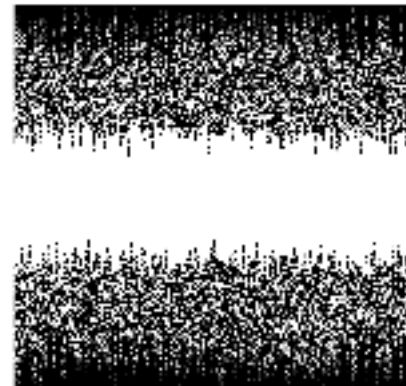


range = 100

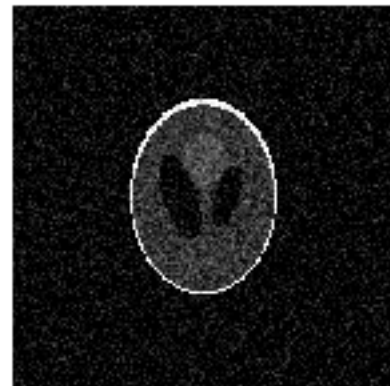
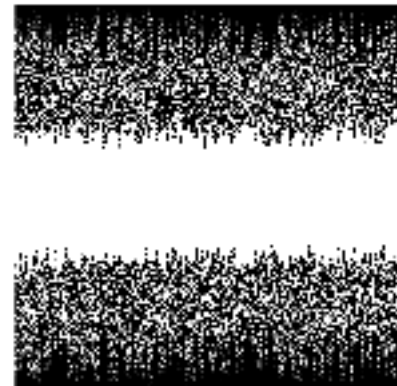


Under noise

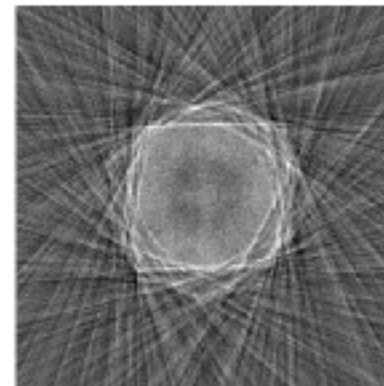
Sinogram of moving image, variance = 0.1



Normalised sinogram



range = 20



Reduce noise in projections
Patch based PCA on every projection

